

MODIS Team Meeting Minutes

Minutes of the MODIS Team Meeting held on Tuesday September 5, 1995.

Action Items:

113. Determine the best method to display a fixed pattern noise (herringbone, Spec 3.4.5.3.3). Assigned to Knight 8/15/95. Due 10/15/95.

114. Determine the extent of ghosting from the SMIR and LWIR polished cold shields. Assigned to Waluschka 8/29/95. Due 9/22/95.

Distribution:

✓ Richard Weber	✓ Bruce Guenther	Larissa Graziani
✓ John Bauernschub	✓ George Daelemans	Bob Martineau
Rosemary Vail	✓ Mitch Davis	✓ Bob Silva
Lisa Shears	✓ Ken Anderson	Robert Kiwak
✓ Mike Roberto	Rick Sabatino	✓ Harvey Safren
Gene Waluschka	Cherie Congedo	Ed Knight
✓ Bill Barnes	✓ Jose Florez	✓ Harry Montgomery
Les Thompson	✓ Gerry Godden	✓ Marvin Maxwell
✓ John Bolton	Sal Cicchelli	✓ Bill Mocarsky

The following items were distributed:

- 1) Weekly Status Report #205
- 2) SBRC Memos submission from week #197
- 3) Minutes of the previous team meeting

MODIS Technical Weekly September 22, 1995

sent to MODIS.Review 9/26/95 at about 7:30 am

1. Introduction

There were no team meetings on September 12 and 19. This report covers from September 5 through September 22.

The Calibration Peer Review was held at SBRC on September 13 and 14. There were also splinter sessions on September 14 and 15. Preliminary comments on the review have been compiled and distributed by Bruce Guenther in an email message dated 23 September.

The Quarterly Management Review was held at GSFC on September 20. Lee Tessmer provided the technical status. It was a successful review. Comments on the review are being compiled and a report will be issued.

On September 21, we reviewed the SBRC I&T schedule plan in detail with Lee Tessmer. The scheduled completion date has a good float, but the plan is based on some optimistic assumptions, so the testing needs to be pared further. We have identified some redundant tests which can be eliminated and others which can be scaled back. We still plan to track instrument stability.

Gene Waluschka is doing a simplified analysis to try to quantify the impact of far field scatter on MODIS performance. He is including the scan mirror and the fold flat as the optical elements which can see clouds directly and scatter light toward the focal plane. The primary mirror scatters light it receives via the scan mirror. Depending on the simplified analysis results, Gene may do a detailed analysis using ray trace techniques.

Bob Martineau provided a status update on the progress on FM1 and FM2 Sensor Chip Assemblies (SCAs). The amount of available detector assets, particularly for the S/MWIR, are limited, making it very important that care is used in handling these assets. Some of these assets could be used as spares for the protoflight instrument, if necessary.

In the electronics area, Jose Florez reported that thirty boards have been built and are waiting for delivery of components to start testing. A problem occurred during testing of the small controller boards for the SRCA and SDSM. Floating inputs were inadvertently tied to a common point which had a potential of 20 volts instead of ground. As of the time of Jose's report, Reliability was looking into this.

Mitch Davis reported that 2 PFM boards that are in test. The first copy of the Single Board Computer is in "powered" testing. The Mechanism Controller has been delivered for testing. The SRCA and SDSM boards (8 total) were scheduled to be temperature cycled the week ending September 23.

Gerry Godden considers calibration options with regard to solar diffuser stray light and provides comments from a couple of references on scratch and dig specs.

2.0 Martineau (FM1 and FM2 Progress; FM1 S/MWIR SCA damaged during wire bonding on FM1 detective assembly)

Author: Robert Martineau at 710

Date: 9/7/95 10:30 AM

SUBJECT: Weekly Input for 9/5/95

1) FM1: S/N FS101 SMWIR SCA is being mounted on the FM1 detective assembly. The FM1 SMWIR FPA mid Oct delivery date will be delayed due to late Band 26 filter fabrication. The FM1 LWIR DA completed assembly and has been delivered to test. The Sept 29 FM1 LWIR FPA delivery date may be delayed due to late LWIR filter assembly receipt. The FM1 NIR and VIS SCAs are mounted. The FM1 NIR FPA has completed final tests. The FPA CTI is planned for Sept 1. The FM1 VIS DA completed 50% of tests without problems. FM1 and FM2 filter assemblies have been received.

2) FM2: Three FM2 SMWIR SCA tests are near completion. S/N FS201 SCA meets spec with 1 bad pixel. S/N FS204 SCA failed tests with single bad pixels in 3 bands. S/N FS202 SCA tests are in process. So far so good. Three potential FM2 LWIR SCA candidates have been identified and are in test. The FV021 and FN014 SCAs have been chosen for the respective FM2 VIS and NIR FPAs.

3) Pedestal/Cable Assemblies: All pedestal/cable assemblies are ready for start of FM2 Detective Assembly builds.

Author: Robert Martineau at 710

Date: 9/14/95 4:17 PM

Subject: Weekly Input for 9/12/95

1) FM1: The S/N FS101 SMWIR SCA was damaged during wire bonding on the FM1 Detective Assembly. The wire bonding tip damaged a corner of the detector array when an automatic wire bonder error caused the tip to go to the wrong point. The error was caused by a corrupted software file used to control the bonder. Corrective action will consist of performing software file checks immediately prior to use on flight hardware.

Unfortunately, S/N FS101 appears to have been damaged beyond use. SCAs S/N FS201 and PFS110 meet spec with 1 bad pixel each. They are presently the designated SCAs for FM1 and FM2 SMWIR FPAs respectively. The replacement FM1 SMWIR detective assembly is expected to be ready for test on Sept 29.

The FM1 LWIR DA is in test. The FM1 VIS FPA is in final test and should go to CTI on Sept 15. The FM1 NIR FPA has been delivered.

2) FM2: Two potential FM SMWIR SCAs are planned for hybridization to generate a backup unit. The FM2 VIS and NIR SCAs are mounted on DAs and wire bonding is in process. The FM2 LWIR and SMWIR DAs will be kitted with designated SCAs next week.

3) Filter Assemblies: The FM2 VIS filter assembly is received. The FM2 NIR filter assembly will arrive Oct 3. The FM1 LWIR filter assembly is due Sept 26. The replacement Band 26 filter for the FM1 SMWIR FPA is expected Oct 2 and the filter assembly Oct 15.

3.0 Jose Florez (Reliability to determine if some controller boards were over stressed; recommend CLAM grounding configuration in test to be the same as when connected to MODIS)

email from Jose Florez, 9/11/95 9:55 am:

Telecon with Ed Clement (SBRC), Mitch Davis and Jose Florez.
September 7, 1995 3:30 pm

Thirty boards have been built and are waiting for delivery of components to start testing. The parts from SEI and Harris are expected to arrive within the next week. In the mean time most of the effort is going into finalizing the test procedures and other documentation.

A problem occurred during testing of the small controller boards for the SRCA and SDSM. Just before testing started it was realized that the redundant side to the one being tested had its inputs floating. The floating inputs were tied to what was supposed to be ground, but in reality was a common point to some signals, and which applied about 20V to the inputs. The parts that were stressed are rated for 5.5V at the input, or a current limit of 10 ma. The problem was realized after a few seconds, and the current drawn was close to 10 ma. The decision was made to go ahead with the testing, and it doesn't look like the parts were damaged. Reliability is studying the problem and will make a final decision. I am forwarding a copy of this memo to Bob Silva so he is aware.

A discussion took place regarding the grounding configuration during testing of the CLAM. Mitch wants to make sure that the CLAM sees the same conditions it will experience when hooked up to MODIS. Ed Clement will discuss the item with Mike Slonaker and Ken Sharmadola and get back to us.

Jose reporting this week.

4.0 Mitch Davis (Electronics Status)

email from Mitch 9/18/95 2:14 PM

Priority: Normal

Subject: Weekly Telecon with Ed Clement

ELECTRONICS REPORT WEEK OF 9/18/95

- There are 2 PFM boards that are in test. The first copy of the Single Board Computer is in "powered" testing. The Mechanism Controller has been delivered for testing.
- The SRCA and SDSM boards (8 total) are in test and will be temperature cycled this week.
- Harris was scheduled to ship the PROM the end of last week.
- SCI was scheduled to ship the SRAMs the end of last week.
- Dave Selby has been working on the FIFO test set, Fred "fixed" a couple of problems before he left, however the changes were never verified.
- Ed Clement has been waiting for formal approval to use the CLAM test procedure. {Action Item to Ken.}

That is all for this week.

Mitchell

5.0 Gerry Godden (Solar Diffuser Stray Light and Scratch and Dig Specs)

Date: 8/28/95 11:15 AM

Subject: Solar Diffuser Straylight

Bruce just picked up a SBRC comment that the Hughes El Segundo ORDAS straylight analysis of the solar diffuser, door, screen, bulkhead and diffuser indicates that there will be 1% straylight contamination during SD measurements (1.00=B10.01 suns on the SD as a function of theta and phi, orbital position, season, etc.).

There is no mention regarding what SBRC plans to do about this. Since it might be argued that 1% is within the allowed radiometric uncertainty for the reflective bands, it could well turn out that nothing will be done about this. It is not known what the major sources of the straylight are. Dick Weber directed SBRC to drill and tap the beryllium bulkhead for required screw holes so the option could be keep open to add a knife edge aperture plate to the bulkhead SD port. It seems unlikely that SBRC will measure the straylight effect on the PFM (though arguably they should to confirm a null straylight response).

The question is raised, "What should we do about this regarding calibration"? If we do not get satisfactory characterization of the SD straylight during SBRC testing of the PFM, then it seems we will have to rely on analysis and on-orbit measurement. The risk of relying on the ORDAS analysis is that the model maybe

too simplified (features such as glints, edge scatter, etc. are quite difficult to accurately model), and whereas the ORDAS model may indicate the straylight to be a slowly varying function of theta and phi, in reality there could be glints or scatter paths that show up only at a very narrow angular range. This would argue for tests to measure the straylight carefully, in small angular increments through out the $7=B_0$ to $9=B_0$ declination by $23=B_0$ azimuth angular range for which the SD will be used (a difficult goniometric test).

An option to consider (if we do not get hardware fixes and detailed straylight measurements) is to use the ORDAS model results (hopefully available in suitable format) to develop a nominal straylight correction algorithm to carry in to orbit, and then follow-up with on-orbit measurement of the SD straylight function (difficult to do because we will be guessing for quite a while, what part of any change is due to straylight changes and what part is due to SD or instrument calibration changes). Notionally, we could map out the SD straylight in $1=B_0$ increments through out the $7=B_0$ by $23=B_0$ operational angular range (161 measurements, probably time= s two or three to get some measure of the overall stability, and to help isolate other SD and instrument degradation factors. This would call for commanding a small and precise spacecraft maneuver, once per orbit for 23 to 35 days ($161/14 = 3D$ 11.5 days X 2 to 3). A considerable round the clock effort during A&E.

We need to be very attentive to the actual details of what is going on here and start thinking ahead about how we are going to accomplish the measurements we need to reduce our total uncertainty to within the allowed budgets.

Date: 9/1/95 3:09 PM
Subject: FYI: Scratches and Digs

I note from SPIE Publication Vol. 1530, page 28, by I. Lewis et al, the following conclusions:

A single #50 dig within a 20 mm diameter aperture will increase the overall scattering level of an otherwise 0.05 (Bo) smooth surface by approximately a factor of 2 to 3. A #40 dig induces an increase of 2X; a # 10 dig 10%, and a #5 dig 2%. A single large dig in a 20 mm diameter will noticeably increase the average scattering of and otherwise high quality surface. Variations between reference standards are clearly evident, with the scattering from the # 10 scratches actually measuring higher than the # 20 scratches. Meeting a scratch/dig comparison only means that the surface scatter may be as low as the scattering levels measured on the isolated defects (averaged over the surface), but could be much higher if the microroughness is large.

Date: 9/1/95 3:30 PM
Subject: FYI: Scratches and Digs - Part 2

Reference: "Scratch-and-dig standard revisited", Matt Young, Applied Optics, Vol.25, No. 12, June 1986, p1922

The scratch-and-dig standard was implemented in the mid-1940s by McLeod and Sherwood. They made clear that the standard is cosmetic and noted "that there is little correlation between the appearance or visibility of a scratch and its measured width. The shape of the scratch has a lot to do with its visibility... The samples ... have been selected to look alike, not necessarily to have the same measured widths".

The scratch-and-dig standards is a cosmetic standard and was never intended for use as a performance or functional standard. It is a standard of workmanship and is valuable for that reason alone. ... When an unusually good surface finish is required, designers sometimes specify 0-0, or no scratches or digs. In the

context of the scratch-and-dig standard, such a specification means an absence of scratches and digs as seen by the naked eye from an ~ 25 cm distance and under the conditions of illumination specified in the standard..... When measured width or overall surface scattering is important, other standards will have to be employed.... TIS is an objective standard, but it is not a performance standard, in part because the measurement specifically excludes light scattered into a 2.5 degree or $f/11$ cone. Although it gives an appraisal of surface quality, TIS is not appropriate to machined surfaces (which may scatter light primarily into specific directions) or to instruments in which small-angle scattering or retroreflection is important. In such cases, it may be necessary to use MTF or scattered power as a function of angle.

Gerry Godden

MR

9/25/95